TTHM & HAA5

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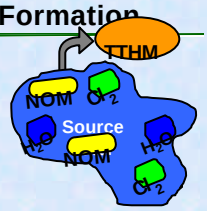
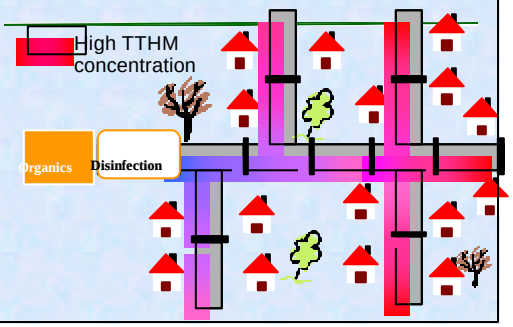
TTHM & HAA5 Formation

- Product of reaction between chemical disinfectants and NOM
- Cause cancer, as well as liver, kidney, and central nervous system problems

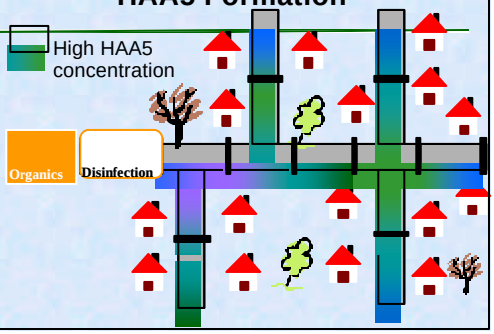


Cl_2 reacts with NOM to form TTHM

TTHM Formation



HAA5 Formation



MCLs

TTHM MCL = 0.080 mg/L
HAA5 MCL = 0.060 mg/L

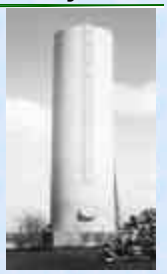
- Applies to CWSs and NTNCWSs that add a disinfectant to their water
- Reduces health risks associated with elevated levels of byproducts

Monitoring

- **Group 1 Systems:**
  - Ground water systems serving < 10,000
  - Subpart H systems serving < 500
- **Group 2 Systems:**
  - Ground water systems serving at least 10,000
  - Subpart H systems serving 500 – 9,999

Monitoring Frequency

- **Based on number of plants, population served, and whether the system is a Subpart H system**
- **Multiple wells drawing from same aquifer may be considered one treatment plant**



Monitoring: Group 1

GW < 10,000
Subpart H < 500

- **Routine:**
  - 1 annual sample per treatment plant at MRT
  - Take in month of warmest water temperature
- **Increased:**
  - Quarterly if an annual sample > MCL
  - Exceedance of either MCL – system must increase monitoring for both

Monitoring: Group 1

GW < 10,000
Subpart H < 500

Reduced:

- **GW systems serving < 10,000**
  - State may approve reduced monitoring if:
    - TTHM RAA ≤ 0.040 mg/L & HAA5 RAA ≤ 0.030 mg/L for two consecutive years,

    OR
    - TTHM RAA ≤ 0.020 mg/L & HAA5 RAA ≤ 0.015 mg/L for one year
  - Minimum 1 sample per plant per 3-year cycle
- **No reduced monitoring for Subpart H systems serving < 500**

Monitoring: Group 2

Subpart H 500 - 9,999
or GW 3 10,000

Routine Monitoring:

- 1 sample per treatment plant per quarter
- Sample at MRT

Increased Monitoring:

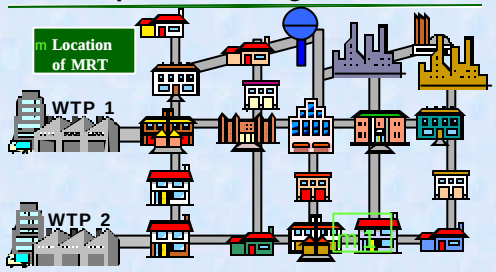
- None

Monitoring: Group 2

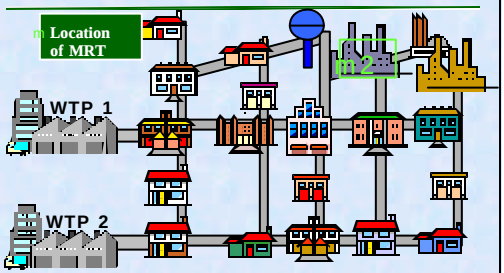
Subpart H 500 - 9,999
or GW 3 10,000

- State may approve reduced monitoring if:
  - TTHM annual average ≤ 0.040 mg/L
  - HAA5 annual average ≤ 0.030 mg/L
  - TOC levels ≤ 4.0 mg/L prior to treatment (Subpart H only)
  - Need results for 1 year
  - To remain on reduced monitoring, all results and RAAs of results must be ≤ 0.060 mg/L for TTHM and ≤ 0.045 mg/L for HAA5. If results exceed these levels, a system must return to routine monitoring
- Minimum 1 sample per plant per year during month of warmest water temperature

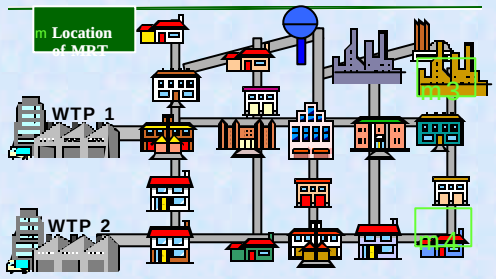
Example Monitoring Location 1



Example Monitoring Location 2



Example Monitoring Location 3



Calculating Compliance

- Quarterly Monitoring
  - Calculate RAA at the end of every quarter in which monitoring occurs
  - RAA > MCL is a violation
- Annual Monitoring
  - If annual sample > MCL, system is only in violation if annual sample, divided by 4, is > MCL

Calculating Compliance: Group 1

GW < 10,000
Subpart H < 500

- EXAMPLE 1
  - TTHM annual sample collected in August 2004
  - Annual sample = 0.033 mg/L
- RESULTS
  - System is in compliance and remains on annual schedule
  - < MCL

Calculating Compliance: Group 1

GW < 10,000
Subpart H < 500

- EXAMPLE 2
  - TTHM annual sample collected in August 2004
  - Annual sample = 0.092 mg/L
- RESULTS
  - System is in compliance but must begin quarterly monitoring
  - > MCL; Result divided by 4 is $\leq$ MCL

Calculating Compliance: Group 2

Subpart H 500 -9,999 or GW ^{3} 10,000

EXAMPLE 1

- Identify results from last 4 quarters to calculate RAA
- TTHM sample Quarter 3 2005
  - 3Q 2005: 0.070 mg/L
- Previous TTHM Quarterly averages
  - 2Q 2005: 0.080 mg/L
  - 1Q 2005: 0.080 mg/L
  - 4Q 2004: 0.090 mg/L

Calculating Compliance: Group 2

Subpart H 500 -9,999 or GW ^{3} 10,000

CALCULATION

- Use four quarters of results to calculate a TTHM RAA
- Sum of quarterly averages = (0.090 + 0.080 + 0.080 + 0.070) = 0.320 mg/L
  - RAA is calculated by (0.320/4) = 0.080 mg/L
- RAA of 0.080 mg/L $\leq$ MCL

Calculating Compliance: Group 2

Subpart H 500 -9,999 or GW ^{3} 10,000

- EXAMPLE 2 (Reduced Monitoring)
  - TTHM annual sample collected in August 2004
  - Annual sample = 0.033 mg/L
- RESULTS
  - < MCL
  - TTHM < 0.060 mg/L; HAA5 < 0.045 mg/L
  - System is in compliance and remains on annual schedule

Returning to Compliance

- Source water changes
- Partnership with other systems

Returning to Compliance

- Best Available Technologies (BATs)
- Modify treatment
- Enhanced coagulation and softening

TTHM & HAA5 Workshop

Instructions

You will be working through compliance calculations for TTHM and HAA5. Use a blank sheet of paper for calculations, if necessary.

Question 1

Routine quarterly monitoring

Quarter	Sampling Results (in mg/L)	
	TTHM	HAA5
Q4 2004	0.075	0.030
Q1 2005	0.050	0.045
Q2 2005	0.082	0.055
Q3 2005	0.057	0.038

Answer to Question 1

Results:

TTHM

0.075 + 0.050 + 0.082 + 0.057 = 0.264
0.264 / 4 = 0.066
RAA = 0.066 mg/L < MCL

HAA5

0.030 + 0.045 + 0.055 + 0.038 = 0.168
0.168 / 4 = 0.042
RAA = 0.042 mg/L < MCL

The system is in compliance with the TTHM and HAA5 requirements of the Stage 1 DBPR.

Question 2

Routine annual monitoring:

- Date samples collected: 8/04/2005
- Sample results:
  - TTHM = 0.087 mg/L
  - HAA5 = 0.060 mg/L
- Has the system committed a violation?

Answer to Question 2

The system has not committed a violation.

- Although the TTHM result exceeded the MCL, it was not high enough to immediately trigger an MCL violation
  - 0.087 / 4 = 0.022 < MCL
- The system must begin quarterly monitoring next quarter (4th Quarter)

Question 3

Routine annual monitoring:

- System collects 4 TTHM samples (3 samples more than required; specified in monitoring plan as compliance samples)
- Results of 4 TTHM samples:
  - 0.075 mg/L; 0.078 mg/L; 0.084 mg/L; 0.077 mg/L
- Determine next steps for the system

Answer to Question 3

- **Results:**

  0.075 + 0.078 + 0.084 + 0.077 = 0.314

  0.314 / 4 = 0.079

  Annual Average = 0.079 < MCL

- **The system remains on routine annual monitoring**